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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/873,287	06/05/2001	Tomio Sugiyama	MNL-2635-16	4759
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EXAMINER				
OLSEN, KAJ K				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

09/873,287

Applicant(s)

SUGIYAMA, TOMIO

Examiner

KAJ K. OLSEN

Art Unit

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 April 2009.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6, 14 and 16-23 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-6, 14 and 16-23 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/C2)
Paper No(s)/Mail Date 9/24/2008
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-6, 14, and 16-23 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The examiner cannot find any support in the originally filed disclosure for the reference chamber being “airtightly bounded” by the electrolytic sheet and insulating sheet. The term “airtightly” or its variants do not appear to be in the originally filed disclosure.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-6, 14, and 16-23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
5. In amended claim 1, it is unclear what the metes and bounds of “airtightly” is because the applicant does not appear to have ever defined this term in the originally filed disclosure.
6. It is unclear how to interpret new claim 17 in combination with claim 1. In particular, claim 17 requires the heat generating member to be placed between a pair of insulating sheets. First is it unclear if this pair of insulating sheets can include the earlier disclosed insulating sheet

of claim 1. It would appear based on the applicant's comments that the amendment to the claims is supported by fig. 1 that the applicant intends the pair of insulating sheets of claim 17 to be separate from the insulating sheet of claim 1. In other words, looking at fig. 1, the insulating sheet of claim 1 would refer to layer 13 while the pair of insulating sheets of claim 17 would refer to layers 16 and 22. The problem with such an interpretation is that the examiner does not believe claim 1 as current presented reads on the embodiment of fig. 1, because claim 1 requires "a heater directly attached to a side surface of said insulating sheet" (emphasis added). Layer 13 of fig. 1 is not directly attached to the heater, but has an intervening layer 16. Layer 16 of fig. 1 also would not read on the insulating sheet of claim 1 because layer 16 is never in contact with the electrolytic sheet 11 and couldn't be bonded to it via the set forth crystal phase. The only embodiment claim 1 appears to read on is the embodiment of fig. 6 where the layers 13 and 16 have been unified into a single layer 16. In fact, when applicant made this amendment on 1/17/2006 is when the examiner switched to the teaching of Tatumoto for the 4/6/2006 office action because of the similarity of the structure of Tatumoto (fig. 1) to the present invention embodiment of fig. 6. However, the embodiment of fig. 6 wouldn't read on claim 17 if the specified insulating sheets of claim 17 were interpreted as being different from the insulating sheet of claim 1 (i.e. the embodiment of fig. 6 only has two total insulating sheets). For the purpose of examination, the examiner will presume the insulating sheets of claim 17 can include the insulating sheet of claim 1 (otherwise, claim 17 wouldn't be supported by the disclosure), but clarification is requested.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1, 2, 4-6, 14, 16, 17, 20, 21, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tatumoto et al (USP 5,522,979) in view of either Kobayashi et al (USP 4,961,835) or Nanataki et al (USP 5,419,827) with or without evidence from the instant invention or Fujishiro et al (USP 4,105,524).

9. Tatumoto discloses a multilayered gas sensor comprising laminated layers comprising at least one solid electrolyte sheet 2 containing zirconia and yttria (col. 7, ll. 28-33) and at least one insulating sheet 4 containing alumina (col. 8, ll. 44-53). The insulating sheet 4 of Tatumoto has a gas chamber 40 defined therein into which reference gas is introduced, the reference chamber 40 being bounded by the solid electrolyte sheet 2 and the at least one insulating sheet 4. See fig. 1 and col. 8, ll. 44-53. Tatumoto further discloses the presence of a heater 5 directly attached to a side surface of the insulating sheet to transfer heat generated in said heater to said insulating sheet and said solid electrolyte sheet. See fig. 1 and col. 8, ll. 1-6. Tatumoto further teaches that the solid electrolyte sheet and the insulating sheet having the heater are laminated and sintered to be integrally bonded to each other. See col. 8, ll. 54-64. Tatumoto does not explicitly disclose the use of silicon dioxide in the electrolyte of the sensor. Kobayashi teaches that a combination of yttria and silicon dioxide added to the electrolyte creates an electrolyte with a thermal

expansion coefficient which is close to that of non-electrolytic ceramics. See col. 2, ll. 44-57. Nanataki similarly teaches that the addition of silicon dioxide to the other stabilizing agents provides a sensor with excellent thermal shock resistance. See the abstract and col. 6, ll. 7-21. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teachings of either Kobayashi or Nanataki for the sensor of Tatumoto both to make the thermal expansion of the electrolyte as closely match that of the non-electrolyte ceramic 4 and to increase the thermal shock resistance of the electrolyte.

10. With respect to a crystal phase containing silicon dioxide that intervenes between the solid electrolyte sheet and the insulating sheet, where this crystal phase liquefies during the sintering so as to generate material transfer, the present disclosure evidences that silicon dioxide adding to the electrolyte followed by subsequent sintering results in the set forth bonding boundary. See page 5, lines 5-17 of the specification. This is further evidenced by the teaching of Fujishiro, which states that SiO_2 forms a "secondary phase distinct from the solid solution" and "exhibit strong affinity for the above metallic coatings". See col. 5, lines 21-26. Hence it would appear that it was already known in the prior art that materials like SiO_2 form a phase distinct from the solid electrolyte phase on the surface of the electrolyte (i.e. where the electrodes of Fujishiro are) and assist in the bonding of layers to that electrolyte. It is noted that Tatumoto has the electrolyte 2 bonding both electrode 31 and the insulating sheet 4 on the same surface (see fig. 1), this would indicate that if the SiO_2 formed a secondary phase next to the electrode (as Fujishiro suggests), then this secondary phase would also be present on the bonding boundary between the electrolyte and the insulating sheet. Because it would have been obvious for Tatumoto to add silicon dioxide to the electrolyte for the reasons set forth above, said

incorporation of silicon dioxide would have inherently resulted in the claimed bonding boundary of the claim.

11. With respect to the new limitation of claim 1 requiring the reference chamber to be airtightly bounded by said integrally bonded electrolytic sheet and insulating sheet, Tatumoto discloses the reference chamber is formed by a U-shape in the insulating sheet (col. 8, ll. 44-53) so the reference chamber appears to be bounded on three sides by the insulating layer 4 with a top being formed by the electrolytic sheet. See fig. 1 and 2. With respect to this binding being “airtightly”, this term does not appear to have ever been disclosed or defined in the originally filed disclosure so it is unclear what the metes and bound of this term are. Because Tatumoto discloses that both the electrolytic sheet and insulating layer 4 are dense (col. 9, ll. 3-8) and because these sheets are presumably bound together during the sintering process (col. 8, ll. 54-64), the presumption is that the structure created by the process of Tatumoto would inherently constitute an airtight structure giving the claim language its broadest reasonable interpretation, especially in view of the unclear scope of the term “airtightly” by the applicant. Moreover, even if the examiner assumed the applicant was referring to some additional sealing provided by the crystalline phase of SiO_2 , then this would be yet another phenomenological result of the addition of SiO_2 to the solid electrolyte, which has been rendered obvious by the teachings of Kobayashi and Nanataki.

12. With respect to the addition of other components to the crystal phase, Tatumoto teaches the addition of other stabilizing agents like MgO and CaO could be utilized (col. 7, ll. 28-33) and Nanataki teaches using a combination of MgO and SiO_2 as a sintering aid (col. 6, ll. 30-37).

13. With respect to the specified thermal expansion coefficient and the sintering contraction coefficient, this would appear to be a result of the addition of SiO_2 and/or Al_2O_3 to the electrolyte. Kobayashi teaches adding SiO_2 to the electrolyte to bring its thermal expansion coefficient close to that of non-electrolytic ceramics (e.g. alumina). See col. 2, ll. 54-57. Nanataki teaches the addition of both SiO_2 and alumina to the electrolyte in concentrations overlapping that of the instant invention. Compare col. 5, l. 60 through col. 6, l. 21 of Nanataki with p. 23, ll. 27-31 of the instant invention. Hence, it would appear the specified levels of thermal expansion coefficient and sintering contraction coefficient would be inherent from the addition of SiO_2 or SiO_2 and Al_2O_3 to the electrolyte as taught by Kobayashi and Nanataki. See also Tatumoto, col. 2, ll. 15-22, 66, and 67 and the alternative rejection below.
14. With respect to the specified Miller index face, again this appears to be a result of the specified addition of SiO_2 to the electrolyte.
15. With respect to the set forth first and second electrodes, Tatumoto discloses a first electrode 32 exposed to a measuring gas while second electrode 31 is exposed to a reference gas in a reference gas chamber 40. See fig. 1 and col. 8, ll. 54-59.
16. With respect to the pair of insulating sheets embedding the heater elements, see elements 4 and 50 of fig. 1. See also the 112 rejection for claim 17 above for how claim 17 is being interpreted.
17. With respect to adding SiO_2 to the zirconia green sheets, see Kobayashi col. 3, ll. 41-57 and Nanataki table 1.
18. With respect to the electrolyte containing both SiO_2 and Al_2O_3 in the set forth percentages, see table 1 of Nanataki.

19. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable Tatumoto in view of either Kobayashi or Nanataki as applied to claim 1 above and in further view of Ishiguro et al (USP 4,851,105).

20. This claim further differs by calling for the bonding boundary to be undulated. Ishiguro discloses a zirconia sheet bonded to an alumina-containing sheet 12 at an undulating boundary. See figure 2(b). It would have been obvious for Tatumoto in view of Kobayashi or Nanataki to adopt the undulating boundary of Ishiguro in order to strengthen the anchoring/bonding of a zirconia sheet to an alumina sheet, as discussed at col. 6, lines 24-41 of Ishiguro.

21. Claim 5 is rejected in the alternative under 35 U.S.C. 103(a) as being unpatentable over Tatumoto in view of Kobayashi and Nanataki as applied to claim 1 above and in further view of JP 9-26409 (hereafter "JP '409").

22. In the rejection above, the examiner was of the opinion that the specified electrolyte compositions of Kobayashi and Nanataki inherently established the set forth thermal expansion coefficient. If Kobayashi and Nanataki are deemed to not inherently establish this, then JP '409 discloses that the electrolyte and insulating sheet should have a thermal expansion coefficient difference of between 0 and 0.2%. See p. 4, ll. 7-8 of the translation. It would have been obvious for Tatumoto in view of either Kobayashi or Nanataki to adopt a virtually zero difference between these coefficients, as taught by JP '409, in order to minimize thermal stress. Both Tatumoto and Kobayashi recognized the need for minimal thermal stress. See the discussion above.

23. Claim 6 is rejected in the alternative under 35 U.S.C. 103(a) as being unpatentable over Tatumoto in view of Kobayashi and Nanataki as applied to claim 1 above and in further view of JP 08-114571 (hereafter "JP '571").

24. In the rejection above, the examiner was of the opinion that the specified electrolyte compositions of Kobayashi and Nanataki inherently established the set forth sintering contraction coefficient. In addition, Tatumoto at col. 2, ll. 15-22, 66, and 67 appears to establish that the electrolyte and insulating sheet already had nearly identical contraction coefficients. If Kobayashi, Nanataki and Tatumoto are deemed to not inherently establish this, then JP '571 discloses such a sintering contraction coefficient difference. See the fourth line from the bottom of the English abstract. It would have been obvious for Tatumoto in view of Kobayashi and Nanataki to adopt this sintering contraction coefficient difference to minimize thermal stress.

25. Claims 18, 19, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tatumoto in view of Kobayashi or Nanataki as applied to claim 1 above, and further in view of any of Furusaki et al (USP 4,857,275), Shibata et al (USP 4,582,657), or Kojima et al (USP 4,863,584) with evidence from the Engineered Materials Handbook, vol. 4, 1991, pp. 188.

26. With respect to claims 18 and 19, the references set forth all the limitations of the claim, but did not explicitly set forth the addition of SiO_2 to the insulating sheet. Each of Furusaki, Shibata, and Kojima set forth that it was conventional in the art to add a small amount (3-4%) of SiO_2 to the alumina mixture of the insulating sheet. See Furusaki col. 7, ll. 28-42; Shibata col. 11, ll. 39-43; and Kojima col. 9, ll. 12-15. Although none of these references explicitly disclosed why the SiO_2 was being added to the alumina, it is well known that SiO_2 is a sintering aid for alumina ceramics. See Table 1 of Engineered Materials Handbook. It would have been obvious

to one of ordinary skill in the art at the time the invention was being made to utilize the teachings of any of Furusaki, Shibata, or Kojima for the sensor of Tatumoto and Kobayashi or Nanataki in order to improve the sintering properties of the alumina sheet.

27. With respect to claim 22, Kobayashi and Nanataki already rendered obvious the use of a solid electrolyte sheet containing SiO_2 and the above Furusaki, Shibata, and Kojima rendered obvious the use of an alumina sheet containing SiO_2 .

Response to Arguments

28. Applicant's arguments filed 4/2/2009 have been fully considered but they are not persuasive. Applicant urges that none of the teachings of Tatumoto, Kobayashi, or Nanataki teach or suggest the addition of SiO_2 to facilitate the bonding of the electrolyte and the insulating sheet. This is unpersuasive for two reasons. First, it is unclear the relevance of this argument as it was not necessary for the prior art to explicitly recite the presence of the SiO_2 crystal phase either, because the examiner was able to establish that this would have inherently resulted from the addition of SiO_2 to the electrolyte. See the Board decision of 2/4/2009. By this same rationale, the supposed increase in bonding between the solid electrolytic sheet and the insulating sheet would appear to be just a further manifestation of addition of SiO_2 to the electrolyte and would have inherently resulted in the increased bonding of these two sheets together. Second, the claims have not defined any particular degree of airtightness (see 112 rejections above), so it is unclear how the claimed airtightness of the present invention reads free of the inherent degree of airtightness that Tatumoto would have inherently had even without the addition of SiO_2 as suggested by Kobayashi and Nanataki.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KAJ K. OLSEN whose telephone number is (571)272-1344. The examiner can normally be reached on M-F 5:30-2:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kaj K Olsen/
Primary Examiner, Art Unit 1795
June 17, 2009